Testimony to the Committee on Science
of the U.S. House of Representatives Briefing on

Innovation and Information Technology: The Government, University, and Industry Roles in Information Technology Research and Commercialization

Neil Iscoe, Ph.D.
Director, Office of Technology Commercialization
The University of Texas at Austin

May 5, 2006

Chairman Smith, Congressman McCaul, thank you for this opportunity to testify today to the Committee on Science. I work with Dr. Sanchez and direct the University of Texas at Austin's commercialization of technology.

We live in a technological age in which inventions, that were previously the province of science fiction, are now commonplace. Cell phones, computers, and other information technologies shape our reality, and give us new ways to see what the future will bring. In retrospect, the multitude of new technologies and products are the logical consequence of known technology trends. But at the time a technology is introduced, its impact is rarely understood.

Predicting the future, however, is a difficult and risky bet for companies with payroll to make and stockholders to satisfy. Even sophisticated market research can not determine the needs of markets that do not yet exist. In 1943, Tom Watson, the CEO of IBM predicted that "there is a world market for maybe five computers." In 1952, IBM revised its forecast to predict that the world market for computers would be ten times the original estimate. Corporations make market predictions based on the markets that they can see.

How is it possible, then, to choose where to spend development dollars, when it is ultimately the market that determines success? How can the Federal Government work with Universities and Industry to maintain the United States lead in IT technology?

It is appropriate that these questions be asked at the 2006 World Congress on Information Technology; for it is the Federal Government's investments in IT research that created the science, protocols, and alphabet soup of acronyms that are the Internet. In the interest of time, I will not give the history of the Internet, but note that as a case study, the development of the Internet illustrates the successful operation and future potential of the ecosystem shared by the Federal Government, U.S. Universities, and U.S. Industry.

Ecosystems include their participants, the complex set of relationships between them, and the externalities that affect them. The relationships between Government agencies, Universities, Industry, and capital, are links that promote and sustain technological advancement even when buffeted by the cyclical flows of the market. Like a biological ecosystem, it is the robustness and complexity of the relationships—the links between the players—that makes the ecosystem work. If we can clearly and transparently understand, strengthen, and explain these relationships, we can accelerate our ability to maintain the United States' lead in innovation.

Since this is a Texas field briefing, let's look at a local example of an ecosystem. We can see the success of Bluebonnets in the display of color that we are privileged to watch each Spring. Each season's output is determined by parameters that include the number of seeds from the previous Spring, and the conditions (e.g. temperature, drought, bulldozers, animals) of the previous Fall. Different seeds sprout under different circumstances so that there will always be a next season.

Similarly, the ecosystem of Government, University, and Industry can be both robust and sustainable. While not all scientific paths produce a commercial product, the interplay of federal funding, university exploration, and industrial application has the potential to provide enough inventions (i.e. the seeds) that U.S. entrepreneurs and corporations can turn them into products

even while facing the challenges of cyclical economies, changing technologies, and international competition.

As industries mature, they become efficient at product improvement. However, as Clayton Christensen observed in "The Innovator's Dilemma," mature industries have difficulty valuing disruptive technologies. Furthermore, the uncertainties of any particular research initiative and the continually changing technological and competitive landscape have made it increasingly more difficult for U.S. corporations to operate on a long time horizon. As the corporations close their industrial labs, the role of research in the United States is shifting to the Universities.

This is where the Federal Government, Universities, startups, and early stage investment capital can keep the ecosystem healthy. As an example, let's look at the fundamental process, lithography, behind Moore's law and the twenty year semiconductor roadmap by which Moore's law continues. The problem is that roadmaps do not allow for the changes in direction (i.e. disruptive technologies).

Lithography is a photographic process based on light. Improvements in lithography therefore focus on light. But what if, instead of using light, it was possible to build a mechanical device that could operate within the nanometers of precision previously achieved with light? At the University of Texas, with Federal Government funding and Industry collaboration, mechanical and chemical engineers came up with that idea. Systematically attacking obstacles, they developed a new form of lithography, based on mechanical processes—a nano-printing press—that has the potential to disruptively eliminate the need to use light, thereby extending Moore's law. The University of Texas has licensed the invention to a local startup, Molecular Imprints.

The company, which was founded in 2001, has received over $60 million in investment capital, and along with other Industrial partners, almost $45 million in Federal Government funding through ATP, DARPA, and other initiatives. The company is now producing a machine that has the potential to revolutionize the fabrication of semiconductors. But that is only the beginning. Just as Gutenberg's printing press changed the world by making books available to everyone, the nano-printing press has the potential of mass producing nano-devices. These devices will, in turn, spawn industries which can not yet be seen.

Federal scientific funding builds a base from which innovations such as the Internet and the nano-printing press can emerge. But just as all Bluebonnet seeds do not immediately result in Bluebonnets, not all ideas germinate in all conditions. Markets are the ultimate definition of success, and market conditions vary.

As a University commercialization office, our goal is to work with government and industry to systematically make the matching process between ideas and commercialization partners more efficient, and to maximize the interactions so that new and existing relationships are more likely to result in serendipitous matches. Existing programs such as SBIR, STTR, and ATP all help move technologies from the University to Industry. State and Regional programs such as the Texas Emerging Technology Fund fund ideas that are not yet ready for commercial capital.

In today's high tech world, it is easy to forget that the first computer was invented almost two centuries ago by Charles Babbage. His invention worked, but the manufacturing precision of the 19th century was not, at the time, sufficiently advanced to build his machine. In the 21st century, we are living in an age in which innovations are being delivered at an exponentially increasing rate.

The IT revolution has flattened the economic playing field, creating both challenges and opportunities for the United States. We no longer have a monopoly on technology production, communication, or even programming. But we are the acknowledged leaders of innovation. We have the talent and the ability to continue to grow a sustainable Government/University/Industry ecosystem that increases the yield from scientific research.

The next decade is crucial. We must continue to produce scientific results in University laboratories supported by government funding. The Universities must work closely with entrepreneurs, investors, and established industry to move scientific discoveries into products that can be used by society.

The United States leads the world in innovation. By focusing on the relationships between Government, Universities, and Industry, we can stay that way.